Project Report: Significance of photochemistry in determining the inorganic and organic chemistry of protoplanetary materials

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Project Progress

The goals of this project are to determine the origin of ^{16}O–poor water in the solar nebula, and to predict isotope anomalies in other nebular oxygen reservoirs (e.g., oxygen–containing organics) with an eye towards understanding the significance of photochemistry in determining the inorganic and organic chemistry of protoplanetary materials. James Lyons has converted an atmospheric chemistry model into a one–dimensional (1–D) solar nebula model, and has used the model to show that ^{16}O–poor water is produced in the nebula as a result of photodissociation of CO. These results have been submitted to the journal *Nature* (authors Lyons and Young), and, after receiving reviews, Lyons is presently making revisions and preparing the manuscript for resubmission. Lyons has presented these results at Lunar and Planetary Science Conference (LPSC) and Goldschmidt meetings during the past year.

Highlights

- A photochemical model of the solar nebula developed by Lyons and Young has shown that CO photodissociation can explain the origin of ^{16}O–poor water that is inferred to have been present in the nebula. This may explain the 30–year old conundrum of the oxygen isotope anomalies seen in calcium–aluminum inclusions (CAIs) in primitive meteorites.

Roadmap Objectives

- ***Objective No. 3.1:*** Sources of prebiotic materials and catalysts